FORM A

SOLICITED PROPOSAL APPLICATION FOR THE NASA OLMSA MICROGRAVITY RESEARCH DIVISION

IN RESPONSE TO ANNOUNCEMENT NRA-99-HEDS-04

PLEASE FOLLOW INSTRUCTIONS CAREFULLY

LEAVE BLANK

1. COMPLETE TITLE OF PROJECT

2. PRINCIPAL INVESTIGATOR (First, middle, and last name; degrees; position)

3. COMPLETE MAILING ADDRESS

Internal Mail Code or Location
Office or Organization Division
Agency/Center, Company, or Institution
Street or P.O. Box
City, State Zip Code

4. TELEPHONE NUMBER (area code, number, extension)

FAX NUMBER
E-MAIL ADDRESS

5. CONGRESSIONAL DISTRICT (U.S. ONLY)

6. SOCIAL SECURITY # (U.S. ONLY)

7. THIS PROPOSAL IS: ☐ NEW ☐ RENEWAL ☐ REVISED

8. HAS THIS PROPOSAL (OR SIMILAR REQUEST) BEEN SUBMITTED TO ANY OTHER AGENCY?
☐ No ☐ Yes IF YES, SPECIFY AGENCY AND YEAR SUBMITTED:

9. CO-INVESTIGATORS (First, middle, and last name; degrees)

10. CO-INVESTIGATOR'S ORGANIZATION

11. DATES OF ENTIRE PROPOSED PROJECT PERIOD
From: For years of
Through: support (4 yr. Max.)

12. PROPOSED COST FOR EACH YEAR
12a. Year 1 12b. Year 2
12c. Year 3 12d. Year 4

13. COSTS REQUESTED FOR ENTIRE PROPOSED PROJECT PERIOD

14. APPLICANT ORGANIZATION (Organization Name)

15. TYPE OF ORGANIZATION (U.S. ONLY)
☐ Non Profit ☐ For Profit (General) ☐ For Profit (Small Business) ☐ Public, Specify: ☐ Federal ☐ State ☐ Local

16. ORGANIZATION OFFICIAL TO BE NOTIFIED IF AN AWARD IS MADE (Name, title, address, and telephone number)

17. OFFICIAL SIGNING FOR APPLICANT ORGANIZATION (Name, title, and telephone number)

18. PRINCIPAL INVESTIGATOR/PROGRAM DIRECTOR ASSURANCE:
I agree to accept responsibility for the scientific conduct of the project and to provide the required progress reports if a grant is awarded as a result of this application. Willful provision of false information is a criminal offense (U.S. Code, Title 18, Section 1001).

SIGNATURE OF PERSON NAMED IN 2
(In ink; "Per" signature not acceptable.)

DATE

19. CERTIFICATION AND ACCEPTANCE: By submitting the proposal identified in this Cover Sheet/Proposal Summary in response to NRA 99-HEDS-04, the Authorizing Official of the proposing institution (or the individual proposer if there is no proposing institution):
1) certifies that the statements made in this proposal are true and complete to the best of his/her knowledge; 2) agrees to accept the obligations to comply with the sponsoring agency award terms and conditions if an award is made as a result of this proposal; and 3) if the applicant organization is an entity of the United States of America, confirms compliance with all provisions, rules, and stipulations set forth in the three Certifications contained in this NRA [namely, i) Certification Regarding Debarment, Suspension, and Other Responsibility Matters Primary Cover Transactions, ii) Certification Regarding Lobbying, and iii) Certification of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs]. Willful provision of false information in this proposal and/or its supporting documents, or in reports required under an ensuing award, is a criminal offense (U.S. Code, Title 18, Section 1001).

SIGNATURE OF PERSON NAMED IN 19
(or person named in 2, if there is no proposing institution)
(In ink; "Per" signature not acceptable.)

DATE

FORM B

PROPOSAL EXECUTIVE SUMMARY

Principal Investigator: _____

Co-Investigators: _____
_____
_____

Proposal Title: _____

Ground-based ☐ Flight Research ☐

Executive Summary

Prepare a brief description of the proposal stating the broad, long-term objectives and specific aims of the proposed work. Describe concisely the research design and methods for achieving these objectives and aims. This executive summary is meant to serve as a succinct and accurate description of the proposed work when separated from this application. Limit Executive Summary to two pages or less.

FORM C

PRINCIPAL INVESTIGATOR: _____

BUDGET FOR ENTIRE PROJECT PERIOD DIRECT COSTS ONLY					
BUDGET CATEGORY TOTALS		**1st BUDGET PERIOD**	**ADDITIONAL YEARS OF SUPPORT REQUESTED**		
			2nd	**3rd**	**4th**
PERSONNEL (Salary and Fringe Benefits) (Applicant organization only)					
SUBCONTRACTS					
CONSULTANT COSTS					
EQUIPMENT					
SUPPLIES					
TRAVEL	DOMESTIC				
	NON-DOMESTIC				
OTHER EXPENSES					
TOTAL DIRECT COSTS FOR EACH PERIOD					
TOTAL INDIRECT COSTS FOR EACH PERIOD					
TOTAL DIRECT + INDIRECT COSTS FOR EACH PERIOD					
TOTAL DIRECT + INDIRECT COSTS FOR ENTIRE PROJECT					

JUSTIFICATION FOR UNUSUAL EXPENSES (Detail Justification in Cost Section of Proposal)

SUMMARY PROPOSAL BUDGET FORM D

ORGANIZATION				
PRINCIPAL INVESTIGATOR				
A. SENIOR PERSONNEL: PI, Co-Is, Faculty and Other Senior Associates (List each separately with title, A.7. Show number in brackets)	NASA-Funded Person-months			Funds Requested By
	CAL	ACAD	SUMR	Proposer
1.				$
2.				
3.				
4.				
5.				
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)				
7. ( ) TOTAL SENIOR PERSONNEL (1-6)				
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)				
1. ( ) POST DOCTORAL ASSOCIATES				
2. ( ) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				
3. ( ) GRADUATE STUDENTS				
4. ( ) UNDERGRADUATE STUDENTS				
5. ( ) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				
6. ( ) OTHER				
TOTAL SALARIES AND WAGES (A + B)				
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)				
TOTAL EQUIPMENT				
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				
2. FOREIGN				
F. PARTICIPANT SUPPORT COSTS				
1. STIPENDS $	**Not Applicable to this NRA**			
2. TRAVEL				
3. SUBSISTENCE				
4. OTHER				
( ) TOTAL PARTICIPANT COSTS				
G. OTHER DIRECT COSTS				
1. MATERIALS AND SUPPLIES				
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				
3. CONSULTANT SERVICES				
4. COMPUTER SERVICES				
5. SUBAWARDS				
6. OTHER				
TOTAL OTHER DIRECT COSTS				
H. TOTAL DIRECT COSTS (A THROUGH G)				
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)				
TOTAL INDIRECT COSTS (F&A)				
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				
K. RESIDUAL FUNDS	**Not Applicable to this NRA**			
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)	**Not Applicable to this NRA**			

M. COST-SHARING: PROPOSED LEVEL $	AGREED LEVEL IF DIFFERENT: $
PI TYPED NAME AND SIGNATURE	DATE
ORG. REP. TYPED NAME & SIGNATURE	DATE

INSTRUCTIONS FOR USE OF SUMMARY PROPOSAL BUDGET (NASA FORM D)

1. General

a. Each grant proposal must contain a Summary Proposal Budget in this format unless a pertinent program announcement/solicitation specifically provides otherwise.
b. Copies of NASA Form D and instructions may be reproduced locally.
c. A separate form should be completed for each year of support requested.
d. Completion of this summary does not eliminate the need to document and justify the amounts requested in each category. Such documentation should be provided on additional page(s) immediately following the budget in the proposal and should be identified by line item. The documentation page(s) should be titled "Budget Justification Page."
e. If a revised budget is required by NASA, it must be signed and dated by the Authorized Organizational Representative and Principal Investigator and submitted in at least the original and two copies.

2. Budget Line Items

The following is a brief outline of budget documentation requirements by line item. (NOTE: All documentation, justification required on the line items below should be provided on the Budget Justification Page(s).)

A., B., and C*. Salaries, Wages and Fringe Benefits*. List individually, all senior personnel who were grouped under Part A, the requested person-months to be funded and rates of pay.

D. *Equipment*. Items exceeding $5,000 and 1 year's useful life are defined as permanent equipment (unless lower thresholds are established by the organization). List item and dollar amount for each item. Justify.

E. *Travel*. Address the type and extent of travel and its relation to the project. Itemize by destination and cost and justify travel outside the United States. Include dates of foreign visits or meetings. Fare allowances are limited to round trip, jet-economy rates.

G. *Other Direct Costs*.

1. Materials and Supplies. Indicate types required and estimate costs.
2. Publication, Documentation and Dissemination. Estimate costs of documenting, preparing, publishing, disseminating, and sharing research findings.
3. Consultant Services. Indicate name, daily compensation, and estimated days of service, and justify.
4. Computer Services. Include justification based on estimated computer service rates at the proposing institution. Purchase of equipment should be included under D.
5. Subawards . Also include a complete budget NASA Form D for each subaward and justify details.
6. Other. Itemize and justify. Include computer equipment leasing.

I. *Indirect Costs* (Also known as Facilities and Administrative Costs for Colleges and Universities). Specify current rate(s) and base(s). Use current rate(s) negotiated with the cognizant Federal negotiating agency.

PROPOSERS MUST NOT ALTER OR REARRANGE THE COST CATEGORIES AS THEY APPEAR ON THIS FORM WHICH HAS BEEN DESIGNED FOR COMPATIBILITY WITH DATA CAPTURE BY NASA. IMPROPER COMPLETION OF THIS FORM MAY RESULT IN RETURN OF PROPOSAL.

FORM E

Principal Investigator: _____
Proposal Title (1st few words): _____

RESOURCES REQUESTED FROM NASA

The resources described below are what many current and former investigators have asked NASA to provide to support their research. Please review the descriptions of existing combustion experiment apparatus, standard components/subsystems, facility capabilities and support instrumentation in the attached text; then complete and include this form in your proposal (with any needed supplementary text) to clarify NASA-supplied needs for the proposed experimental research.

The information requested in this form is needed by NASA to evaluate the total annual cost of supporting proposed experimental research to be conducted at the NASA Glenn Research Center. Provisions for work to be conducted elsewhere, i.e. your institution, should not be included here.

(1) Experiment Description. Please provide a brief written description of the experiments that you are proposing to conduct (or reference your proposal text). Include any known sizes, volumes, weights, power consumption levels, etc.		
(2) Existing Apparatus. Please indicate if any EXISTING experiment apparatus would be suitable for conducting the proposed experiments (see descriptive text). If so, please indicate here or attach a brief description of any modifications to the apparatus that would be needed.		
General Purpose Combustion Rigs		
Diagnostic Rigs		
Other existing apparatus		
(3) New Apparatus. Please indicate if you require a NEW experiment apparatus to conduct the proposed experiments. Please attach a brief description of the envisioned apparatus (or reference your proposal text).		**YES / NO**
(4) GFE Hardware. Please indicate the standard components/subsystems listed below that you ask NASA to provide as "Government Furnished Equipment" for a proposed new experiment apparatus (see descriptive text and costs). Indicate the year the item is first needed, i.e. yr1- yr4, and the NASA estimate of item cost.	**Year**	**Estimated Total Item Value**
(a) Standard Test Package Frame (16 " x 38" footprint x 38" tall)		
(b) Test Chamber: 25 cm diameter, 50 cm tall, three mid-height window		
(c) Power Distribution Module: DC voltages, computer switched circuits		
(d) Data Acquisition and Experiment Control System #1 (tattletaleä)		
(e) Data Acquisition and Experiment Control System #2 (pc 104ä)		
(f) Battery Modules (24 – 28 VDC, 5 Amp-hour)		
(g) Gas handling hardware: valves, regulators, bottles, etc. Please describe.		
(h) Other item (describe)		
(i) Other item (describe)		
Total Estimated Value of NASA Supplied Hardware		
(4) Experiment Builder. Please indicate whether your organization proposes to build the new experiment or if you require that NASA build the experiment as "Government Furnished Equipment." Please attach any needed clarification.		**PI / NASA**

(5) Test Facilities. Please estimate the required facility usage (in "weeks") for each year of your proposed experiments:		**GRC 2.2 Second Drop Tower: # weeks @ 10 tests/wk**	**GRC 5 Second Drop Tower: # weeks @ 2 test/wk**	**Reduced-Gravity Aircraft: # weeks @ 160 parabolas/ wk**	**Other NASA facilities: (indicate usage units)**
	Year 1				
	Year 2				
	Year 3				
	Year 4				

(6) Please describe the instrumentation or other resource requirements that you ask NASA to provide for your use while you are at the NASA Glenn Research Center for conducting the proposed experiments or for analyzing results:	
Vacuum Pumps: describe use: i.e. chamber evacuation between tests or continuos flow during tests; approximate flow capacity.	
Consumable Gases: indicate gas species, including "air," and standard cubic feet needed per week of testing.	
Imaging Equipment: video camera, film camera, lens, etc.	
Real-time Video Display (i.e. during the test); number of channels	
Electronic Image Processing (scanning, filtering, etc.)	
General Purpose Computers: describe use, e.g. experiment apparatus interface, data reduction and analysis, etc.	
Image Motion Analysis & Object Tracking System: describe the required measurements, e.g. flame propagation vs. time.	
Other (describe)	
Other (describe)	
Other (describe)	

Note: These resources are available in limited quantities. NASA will work with successful proposers to plan the allocation and scheduling of these resources.

Form E Supplementary Information

NASA Resources for the Support of Ground Based Research in Microgravity Combustion Science

Introduction:

At the NASA Glenn Research Center (GRC), the staff is working to improve the effectiveness of the ground-based combustion research program so that new investigations are prepared more quickly to begin test operations and mature their research for early space-flight opportunities. One objective is to encourage designs of new reduced-gravity experiment packages that can be operated in both drop towers and aircraft using standard components.

This document is intended to provide some introductory information about the ground-based reduced-gravity testing facilities, about some existing combustion test packages that can be used on a shared basis, and about some components/subsystems that could be used to build new experiment packages. These descriptions are intended to assist those planning new experiments in providing NASA with estimates of NASA resources needed to conduct their work.

NASA Ground-Based Reduced-Gravity Test Facilities:

The NASA ground-based reduced-gravity research facilities that support the microgravity combustion program includes two drop towers at the NASA Glenn Research Center (GRC) and a KC-135 aircraft that is based at the NASA Johnson Space Center but will fly 6-10 campaigns per year from GRC.

The 2.2 Second Drop Tower Facility. This drop tower at GRC provides 2.2 seconds of low-gravity test time using vertical free fall for experiment packages with up to 125 kilograms of hardware. The experiment package is enclosed in a drag shield, where the only resistance to free fall is the air drag associated with the relative motion of the package within the enclosure of the drag shield. During testing a net gravitational acceleration of less than 10^{-5}g is obtained. At the end of a drop, the drag shield and the enclosed experiment are decelerated by an inflated airbag. The peak deceleration rate is approximately 30g. The facility is capable of eight to twelve drop tests each day. Experiment package power is supplied by on-board batteries. Data from experiments are acquired via imaging technology and on-board data acquisition systems.

The 5 Second Drop Tower Facility. The larger drop tower at GRC, also known as the Zero-Gravity Facility, has a 132-meter vertical free fall distance inside a vacuum chamber evacuated to 1 Pa pressure. Experiments utilizing hardware weighing up to 450 kilograms are mounted in a one-meter diameter by 3.4-meter high drop bus. Gravitational acceleration of less than 10^{-5} g is obtained during the 5.18 second drop time. At the end of the drop, the bus is decelerated in a 6.1-meter deep container filled with small pellets of expanded polystyrene. The deceleration rate is typically 60g (for 20 millisec). Typically one drop test is performed per day. Experiment package power is supplied by on-board batteries. Data is acquired via onboard imaging technology and by on-board data acquisition systems.

The NASA Reduced-Gravity Aircraft Facility. The NASA KC-135 provides up to 23 seconds of low gravity by flying a parabolic trajectory. Gravity levels within +/- 10^{-2} g are experienced by experiment packages operated attached to the aircraft cabin deck in-between parabola entry and exit levels of nearly 2.0g. Experiments may be “free-floated” within the aircraft cabin to obtain gravity levels as low as 10^{-4} g. Several experiments can participate in a single flight and qualified observers or operators may fly with their experiment packages. The aircraft can supply a total of 80 amps of 28 volt dc, 50 amps of 110 volt ac 60Hz and 20 amps on each phase of 3 phase 110 volt ac 400 Hz. Data is acquired via onboard imaging technology and by on-board data acquisition systems.

Existing Microgravity Combustion Testing Packages:

General Purpose Combustion Rigs. These three packages were designed for use in the 2.2 second drop tower and provide a 10” ID by 21” long chamber equipped with 4 windows at the mid plane with 90 degree spacing. Two opposing windows are 4” in diameter, and the other two are 4” x 6.” Due to the size of the chamber and the drop frame, only 3 windows are accessible at a

time; however the chamber can be rotated to select which three. Four signal/power/igniter wire pairs and 4 type K thermocouple wire pairs are provided in the chamber. Data acquisition and control is via a Tattletale type computer. Power is available at 28, 12, and 5 VDC. A facility for 2 video or 2 movie cameras exists. A gas flow system provides metered fuel flow for gas jet experiments. Maximum operating pressure is 4 Atm, maximum oxygen concentration is 30 %. Utilization of the rigs is generally heavy, so their availability is not guaranteed. In general, they are unavailable in the summer months; time is often available during October through April. The rigs are not available for use away from the GRC. Use of the rigs requires approval by NASA GRC and will require GRC-led coordination with other users. All changes made to the rig by a user must be fully reversible with limited effort (users will likely be required to return the rig to its original condition upon completion of their testing). Users will have to provide their own optics plate, video cameras, and chamber internals unless their needs match an existing configuration. Users are responsible for obtaining their own safety permit, though their GRC technical monitor will facilitate this process.

Combustion Diagnostics Rigs. The two combustion diagnostics rigs are nominally designed for utilization in the 2.2-second drop tower facility. Each rig supports a burner platform providing approximately 75 mm of vertical traverse capability. A removable chamber, 41 cm in height with an inside diameter of 19 cm (11.2 liters), is provided for each burner platform. The chambers are equipped with 4 optical windows, 75 mm in diameter, spaced at 90 degree intervals. The specific pressure rating of these chambers has not been determined. Each rig is equipped with an optical palette to provide a mounting surface for instrumentation. The surface of each palette has a pattern of 1/4-20 threaded holes on one inch centers, identical to that of laboratory optical breadboards. On rig #1, the chamber is centrally located with a surrounding palette. Rig #2 is configured with the burner platform at one end of the rig, with the palette positioned adjacent. Data acquisition and control is via a 486 microcomputer conforming to the PC104 standard. The present capability provides a variety of A/D inputs and outputs, as well as digital I/O lines. Power is available at 28, 12, and 5 VDC. A facility for 2 video or 2 movie cameras exists. A gas flow system provides metered fuel flow for gas jet experiments. Utilization of the rigs is generally heavy, so their availability is not guaranteed. In general, they are unavailable in the summer months; time is often available during October through April. The rigs are not available for use away from the GRC. Use of the rigs requires approval by NASA GRC and will require GRC-led coordination with other users. All changes made to the rig by a user must be fully reversible with limited effort (users will likely be required to return the rig to its original condition upon completion of their testing). Users will have to provide their own optics plate, video cameras and chamber internals unless their needs match an existing configuration. Users are responsible for obtaining their own safety permit, though their GRC technical monitor will facilitate this process.

Standard Component / Subsystems:

Standard Test Package Frame. Standard frames are available that can be used in the 2.2 second drop tower the 5 second “Zero Gravity Facility” and soon in the KC-135 aircraft. The frames are lightweight shells manufactured from rolled and riveted hardened aluminum, with internal dimensions of 16” x 38” footprint x 34” tall. All shelving or other mounting structures, structure added for required mechanical strength (for aircraft use), etc. are the responsibility of the experimenter.

Our estimate of the standard test package frame cost is approximately $800 including materials, machining, forming and joining.

Combustion Chambers. The “standard” combustion chamber is made from 10” aluminum pipe, 20” long (25cm φ x 50 cm long) Three windows are located at the chamber mid-height, two diametrically opposed 4” circular window ports and one orthogonal 4” wide x 6” tall rectangular window port. The chamber closure is a quick-release v-band for both the chamber top and bottom flanges. Provisions are made in the flange design to pin the flanges for alignment purposes. Chamber penetrations are normally through the chamber bottom, for “permanent” elements and through the top for things that need to be frequently extracted from the chamber. The chamber is currently rated for up to 3 Atm. max. working pressure. We are investigating the use of a modified design for higher working pressures. The windows are not included with the chamber.

All windows, plumbing, electrical wiring, experiment specific hardware, diagnostics hardware, etc., and the design and fabrication of the chamber installation into the test apparatus are the responsibility of the experimenter.

Our estimate of the unit chamber cost is approximately $6,000.00, including materials, parts, machining, welding, and surface treatments.

Power Distribution Module. A Power Distribution Module (PDM) provides eight (8) opto-isolated relay switched circuits (2@20A max, 6@4A max), operable via remote TTL-level command and also by panel mounted switches. The PDM provides 3 isolated DC voltage supplies (bulk 12V @ 6A max-6 ports, low-noise 12V@500mA - 4 ports, and one user-configurable low-noise supply (12V/500mA, +/-12V@250mA, +/-15V@200mA, or 5V@1A - 4 ports). Inboard auto-reset capable fusing is provided for the 4A relays and DC voltage supplies to ensure protection of these devices against overloads, and panel mount fuses are provided for configuring the high-current relays, for loads such as cinema cameras, motors, and heating devices. Input power from two sources (battery modules) are required for the PDM to provide the maximum rated current. The nominal PDM enclosure dimensions are 13 x 7 footprint x 2 inches tall, not including connectors and mounting flanges.

Our estimate of the unit PDM cost is approximately $2200 including materials, parts, machining and wiring.

Data Acquisition and Control Systems. Two data acquisition and control systems (DACS) are being designed:

"Tattletale."ä The first system (TT8-DACS) is based on a mature, ruggedized system most often used in the 2.2 second drop tower. It consists of a 68332-based Onset Tattletaleä model 8 datalogger, operating at up to 32MHz, with 256K onboard memory, and a pair of NASA developed support boards which provide ancillary functions, including 20 channels of opto-isolated digital I/O (16 out, 4 in), and eight (8) channels of programmable-gain, differential analog input (12-bit A/D conv). The TT8-DACS is housed in a 5"x7"x2" enclosure, utilizes rugged connectors for signal and power connections, and is programmed using a variant of the BASIC language (2Ksamples/sec/channel max) or in AZTEC C (100Ksamples/sec max).

The TT8-DACS requires an external computer (Windows or MAC) to upload programs, transfer keyboard commands, and for downloading post-test data. Simple communication software is available. Our estimate of the unit TT8-DACS is $2000 including parts, manufacturing and testing.

"PC-104."ä The second system is a PC/104-based system, a stackable form-factor suggested for those ground-based microgravity experiments requiring the power of a traditional, Pentiumä -class computer system. A representative system has been specified, capable of operating programs like LabViewä within the Windows NTä operating system , provides a 233MHz Pentiumä -class processor, 220MB solid-state disk, 64MB DRAM, onboard SVGA and floppy disk hardware support, 16 channels of non-isolated digital I/O, and a 16 single-ended / 8 double-ended 100K samples/sec A/D, including ancillary cables, housed in a ruggedized aluminum chassis. Dimensions of the system described above are approximately 6"x5"x4."

Our estimate of this PC/104-DACS unit cost is about $5000 including parts only. The estimate does not include the operating system software, application software, additional software development, (eg. unique drivers and experiment programming) or hardware assembly and wiring costs.

Battery Modules. Standard 24-28 V DC battery modules are available to provide electrical power to experiments operated in either of the two drop facilities. The modules use "starved electrolyte" lead-acid cells, (2VDC/5amp-hour). Most experiment packages require two or more battery modules.

Our estimate of the unit battery module cost is approximately $250 including materials, parts, machining and wiring.

CHECKLIST FOR PROPOSERS

This checklist should be annotated to indicate that the stated items have been included in the proposal package.
The proposal should also be submitted in this order.

Principal Investigator/Program Director:

1. ☐ Form A: Solicited Proposal Application*
2. ☐ Form B: Proposal Executive Summary
3. ☐ Form C: Summary Budget Form
4. ☐ Form D: Detailed 12 Month Budget Summary (one form for each year of support and each sub-award/sub-contract)
5. ☐ Form E: Estimated Value of Government-Furnished Equipment and Services
6. ☐ Project Description
7. ☐ Management Approach
8. ☐ Letter of Assurance of Foreign Support (if applicable)
9. ☐ Facilities and Equipment Description
10. ☐ Budget Justification Page
11. ☐ Appendices, if any
12. ☐ 15 copies of all material listed above

* One signed original required

Only one copy of the following needs to be submitted:

☐ 3.5 inch computer diskette

☐ Form F: This checklist indicates all applicable items have been enclosed.

CERTIFICATION REGARDING
DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS
PRIMARY COVERED TRANSACTIONS

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 14 CFR Part 1269.

A. The applicant certifies that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this application been convicted or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or Local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or Local) with commission of any of the offenses enumerated in paragraph A.(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or Local) terminated for cause or default; and

B. Where the applicant is unable to certify to any of the statements in this certification, he or she shall attach an explanation to this application.

C. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lowered Tier Covered Transactions (Subgrants or Subcontracts)

(a) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principles is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department of agency.

(b) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

This page has been included for your information. Do not submit this page with your application. Item 19 of Form A satisfies the requirement of compliance with the provisions, rules, and stipulations described on this page.

CERTIFICATION REGARDING LOBBYING

As required by S 1352 Title 31 of the U.S. Code for persons entering into a grant or cooperative agreement over $100,000, the applicant certifies that:

(a) No Federal appropriated funds have been paid or will be paid by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, in connection with making of any Federal grant, the entering into of any cooperative, and the extension, continuation, renewal, amendment, or modification of any Federal grant or cooperative agreement;

(b) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting an officer or employee of any agency, Member of Congress, an or an employee of a Member of Congress in connection with this Federal grant or cooperative agreement, the undersigned shall complete Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(c) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subgrants, contracts under grants and cooperative agreements, and subcontracts), and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by S1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

This page has been included for your information. Do not submit this page with your application. Item 19 of Form A satisfies the requirement of compliance with the provisions, rules, and stipulations described on this page.

CERTIFICATION OF COMPLIANCE WITH THE NASA REGULATIONS PURSUANT TO NONDISCRIMINATION IN FEDERALLY ASSISTED PROGRAMS

The (Institution, corporation, firm, or other organization on whose behalf this assurance is signed, hereinafter called "Applicant") hereby agrees that it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1962 (20 U.S. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S. 794), and the Age Discrimination Act of 1975 (42 U.S. 16101 et seq.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250) (hereinafter called "NASA") issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participating in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives federal financial assistance from NASA; and hereby give assurance that it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which the federal financial assistance is extended to it by NASA.

This assurance is given in consideration of and for the purpose of obtaining any and all federal grants, loans, contracts, property, discounts, or other federal financial assistance extended after the date hereof to the Applicant by NASA, including installment payments after such date on account of applications for federal financial assistance which were approved before such date. The Applicant recognized and agrees that such federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and the United States shall have the right to seek judicial enforcement of this assurance. His assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign on behalf of the Applicant.

This page has been included for your information. Do not submit this page with your application. Item 19 of Form A satisfies the requirement of compliance with the provisions, rules, and stipulations described on this page.